Patent Claims

1. Mixture for applying a polymeric, corrosion-resistant, electrically conductive coating which can be shaped in a low-abrasive manner to a substrate, in particular to a metallic substrate such as e.g. a steel sheet, it being possible for the substrate optionally to be precoated e.g. with at least one zinc layer or/and a zinc-containing alloy layer or/and with at least one pretreatment layer, wherein the mixture comprises, in addition to at least one substance A in the form of electrically conductive hard particles, at least one substance B in the form of very soft or soft, inorganic, electrically conductive or semiconducting particles which are capable of sliding or/and at least one substance C in the form of metallic, soft or hard, electrically conductive or semiconducting particles or/and carbon black and at least one binder and in each case at least one crosslinking agent or/and one photoinitiator and optionally also in each case at least one post-crosslinking compound, one additive, one corrosion protection pigment D, one corrosion inhibitor which is not present in particle form, one organic solvent or/and water, A, B and C being water-insoluble or sparingly water-soluble pigments, characterized in that the sum of the weight contents of the inorganic particles B which are capable of sliding and of the metallic particles or/and carbon black C makes up 0.25 to 99.5 % of the weight contents of the water-insoluble or

sparingly water-soluble pigmentation Σ (A + B + C), and in that the size of the electrically conductive hard particles A, based on the particle size passage value d_{99} measured with a Mastersizer of type S from Malvern Instruments, is less than 10 µm.

2. Mixture according to claim 1, characterized in that the sum of the weight contents of the water-insoluble or sparingly water-soluble pigmentation Σ (A + B + C) relative to the sum of the total pigmentation Σ (A + B + C + D) is 30 to 99 wt.%.

3. Mixture according to claim 1 or 2, characterized in that the mixture of all the types of electrically conductive hard particles A has an average particle size d_{50} in the range from 0.1 to 2.5 µm, in particular in the range from 0.2 to 2 µm.

4. Mixture according to one of the preceding claims, characterized in that the mixture of all the types of electrically conductive hard particles A has a steep particle size distribution in which the passage value d_{99} has a factor of at most 12 relative to the passage value d_{10}.

5. Mixture according to one of the preceding claims, characterized in that on addition to the mixture, the mixture of all the types of very soft or soft particles B which are capable of sliding has a particle size passage value d_{99} in the range from 1 to 30 µm.

6. Mixture according to one of the preceding claims, characterized in that on addition to the mixture, the mixture of all the types of very soft or soft particles B which are capable of sliding has an average particle size d_{50} in the range from 0.1 to 20 µm.

7. Mixture according to one of the preceding claims, characterized in that on addition to the mixture, the average particle size d_{50} of the very soft or soft particles B which are capable of sliding is greater than the average particle size d_{50} of the electrically conductive hard particles A by a factor of 1.5 to 7.

8. Mixture according to one of the preceding claims, characterized in that on addition to the mixture, the mixture of all the types of metallic particles or/and carbon black C has a particle size passage value d_{99} in the range from 0.05 to 20 µm.

9. Mixture according to one of the preceding claims, characterized in that on addition to the mixture, the mixture of all the types of metallic particles or/and carbon black C has an average particle size d_{50} in the range from 0.01 to 10 µm.

10. Mixture according to one of the preceding claims, characterized in that on addition to the mixture, the average particles size d_{50} of the metallic particles or/and carbon black C is greater than the average particle size d_{50} of the electrically

conductive hard particles A by a factor of 0.1 to 4.

11. Mixture according to one of the preceding claims, characterized in that the content of electrically conductive hard particles A in the mixture is 10 to 80 wt.% and the content in the mixture of very soft or soft particles B which are capable of sliding is 0.1 to 16 wt.%, in each case based on the weight of the solid in the wet lacquer.

12. Mixture according to one of the preceding claims, characterized in that the content of metallic particles or/and carbon black C in the mixture is 0 to 75 wt.%, based on the weight of the solid in the wet lacquer.

13. Mixture according to one of the preceding claims, characterized in that on addition to the mixture, the mixture of all the types of corrosion protection particles D has an average particle size d_{50} in the range from 0.01 to 5 µm.

14. Mixture according to one of the preceding claims, characterized in that on addition to the mixture, the mixture of all the types of corrosion protection particles D has the particle size passage value d_{99} in the range from 0.03 to 10 µm.

15. Mixture according to one of the preceding claims, characterized in that the electrically conductive hard particles A comprise substances based on compounds or mixtures of compounds with or of

spinels, such as e.g. Fe_3O_4, Mn_3O_4, $FeMn_2O_4$ or/and further substances based on borides, carbides, oxides, phosphates, phosphides, silicates, silicides or particles having an electrically conductive coating or/and a mixture thereof or a common compound thereof, and in that further metallic particles or/and carbon black C chosen from aluminium, iron, cobalt, copper, molybdenum, nickel, niobium, silver, tantalum, titanium, vanadium, tungsten, zinc, tin, aluminium-, iron-, cobalt-, copper-, molybdenum-, nickel-, niobium-, silver-, tantalum-, titanium-, vanadium-, tungsten-, zinc- or/and tin-containing alloys are optionally present.

16. Mixture according to one of the preceding claims, characterized in that at least 30 wt.% of the electrically conductive hard particles A are oxides or/and phosphides substantially based on aluminium, iron, cobalt, copper, manganese, molybdenum, nickel, niobium, tantalum, titanium, vanadium, tungsten, zinc or/and tin.

17. Mixture according to one of the preceding claims, characterized in that the very soft or soft particles B which are capable of sliding predominantly or entirely comprise graphite, sulfide, selenide or/and telluride, in particular graphite, antimony-containing sulfide, tin-containing sulfide, molybdenum-containing sulfide or/and tungsten-containing sulfide.

18. Mixture according to one of the preceding claims, characterized in that it comprises not more than 0.5 wt.% of wax or/and of substances having wax-like properties, preferably not more than 0.2 wt.%, based on the dry weight of the wet lacquer, particularly preferably no wax and no substances having wax-like properties.

19. Process for the production of a corrosion-resistant, viscoelastic coating comprising polymers and inorganic particles on a substrate, characterized in that a mixture according to one of claims 1 to 18 is applied to an optionally precoated substrate, optionally dried and at least partly crosslinked.

20. Process according to claim 19, characterized in that the very soft or soft particles B which are capable of sliding, such as e.g. graphite, are in each case not ground or are ground with only a low intensity before addition to the mixture or in the mixture or/and in a portion of the mixture.

21. Process according to claim 19 or 20, characterized in that the electrically conductive hard particles A are ground by themselves.

22. Process according to one of claims 19 to 21, characterized in that on grinding of the electrically conductive hard particles A, the over-sized particles are predominantly comminuted, so that a narrower particle size distribution arises.

23. Process according to one of claims 19 to 22, characterized in that the particle size passage value d_{99} of the electrically conductive hard particles A is not substantially greater than, no greater than or only slightly less than the average thickness of the coating.

24. Process according to one of claims 19 to 23, characterized in that the mixture applied to the substrate is dried, stoved, irradiated with free radicals or/and heated in order to form a thoroughly crosslinked, corrosion-resistant, viscoelastic coating.

25. Process according to one of claims 19 to 24, characterized in that a coating having a thickness of less than 10 µm, in particular less than 8 µm, preferably less than 6 µm and particularly preferably of less than 4 µm, measured in the dry state microscopically on a ground cross-section, is produced.

26. Process according to one of claims 19 to 25, characterized in that the mixture is free or substantially free from organic lubricants, such as e.g. based on PTFE, silicone or oil, inorganic or/and organic acids or/and heavy metals and other cations, such as arsenic, lead, cadmium, chromium, cobalt, copper or/and nickel.

27. Process according to one of claims 19 to 26, characterized in that the substrate comprises at least one metal or/and at least one alloy and is

optionally precoated, in particular comprises a sheet comprising aluminium, an aluminium, iron or magnesium alloy or steel, such as e.g. automobile steels.

28. Process according to one of claims 19 to 27, characterized in that the mixture according to the invention is applied directly to a pretreatment coating.

29. Electrically conductive coating comprising polymers and inorganic particles, produced using a mixture according to one of claims 1 to 18 or/and produced using a process according to one of claims 19 to 28.

30. Use of the coating according to claim 29 as a welding primer, as a protective coating during shaping or/and joining, as corrosion protection of surfaces or in the edge, seam or/and welded seam region, as protection instead of a hollow cavity seal or/and a seam seal, in particular for vehicle construction or aircraft construction.